Answer the following questions. Each question counts 5 points.

Calculators are not allowed

1) Evaluate each of the following limits, if it exists:-

   i) $\displaystyle\lim_{x\to 1}\frac{\sqrt{x+1}-\sqrt{2x}}{x^2-x}$ ii) $\displaystyle\lim_{x\to 0}\left(\frac{\tan^3 x}{(x^4+5x^3)}\right)$

2) Use ϵ and δ definition of the limit to show that :

$$\lim_{x\to 1}(-3x+5)=2$$

3) Let f be a function defined on $(-\infty,+\infty)$. If $16 \le f(x) \le x^{\frac{4}{3}}$,for all x,

   find $\displaystyle\lim_{x\to 8} f(x)$

4) Find the vertical and horizontal asymptotes (if any) for the graph of

$$f(x)=\frac{x}{2\sqrt{4x^2-1}}$$

5) State the Intermediate Value Theorem. Then show that the equation

   $x^5+3x^3+2x-8=0$, has at least one real root.

6) Find the constants A and B so that the function

$$f(x)=\begin{cases} Ax-1, & \text{if } x<1 \\ 2x^2+B, & \text{if } x\ge 1 \end{cases}$$

   will be differentiable at $x=1$

7) Find y' , if $\quad y=\dfrac{\sqrt{x}\,\sin x}{\csc x}$

8) Use the definition of the derivative to find $f'(x)$ for $f(x)=x^3$.

Good Luck